HOW TO Identify and Control Rhabdocline and Swiss Needlecasts of Douglas-Fir

United States Department of Agriculture

PREPARED BY **Forest Service**

North Central Forest Experiment Station

Two needlecast fungus diseases- Rhabdocline (*Rhabdocline pseudotsugae*) and Swiss needlecast (*Phaeocryptus gaumanni*)- have become serious problems in Douglas-fir plantations across the United States, particularly in the Northeast and more recently in the Pacific Northwest. These two diseases cause premature needle loss resulting in trees with thin foliage. This condition adversely affects all Douglas-fir plantations, but is especially bad in Christmas tree plantations where thin-foliaged trees may not be salable. Both diseases seem to be more severe on the Rocky Mountain variety of Douglas-fir than on the Pacific coast variety.

These diseases can be controlled-but early detection is important. Described and illustrated here are the symptoms with special emphasis on the most distinguishing features. Disease development will vary somewhat with geographic location.

Rhabdocline infected needles are yellowish brown to reddish brown in spring.

Look for:

Needlecast Stage

Rhabdocline Needlecast

Current years needles develop small yellow spots in late fall or early winter. Yellow spots enlarge and needles appear mottled. By spring the needle spots are a yellowish brown to reddish brown. Sometimes spots coalesce to discolor the entire

needle. The discolored needles are cast in the spring after spore discharge.

Swiss Needlecast
Foliage symptoms include yellowing and browning of needles in late fall of the first year or during spring and summer of second year. Symptoms are most severe on older needles on lower branches. Diseased needles are often uniformly brown at the tips, but never mottled. infected needles are usually cast during late fall and winter.

Needles infected by Swiss needlecast often turn brown at the tips in early spring.

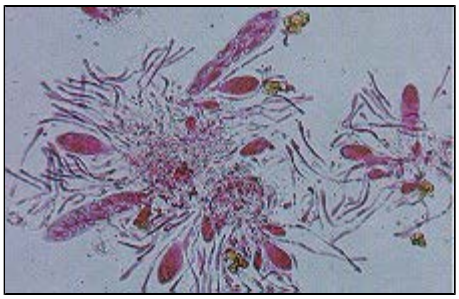
Trees with severe infection by P. gaumanni *often have very few needles remaining prior to spring bud break.*

Spores

Hyaline ascospores are released during wet weather and are wind disseminated.

Rhabdocline Needlecast
1-celled bone shaped 7x19 microns.

Swiss Needlecast
2-celled spores 4x14 microns



Ascospores of R. pseudotsugae *are windblown and infect the young needles of opening buds.*

Fruiting Stage

Fungus fruiting bodies develop on infected needles on the tree.

Rhabdocline Needlecast
Depending on the sub-species of the fungus, fruiting bodies develop on 1-year-old

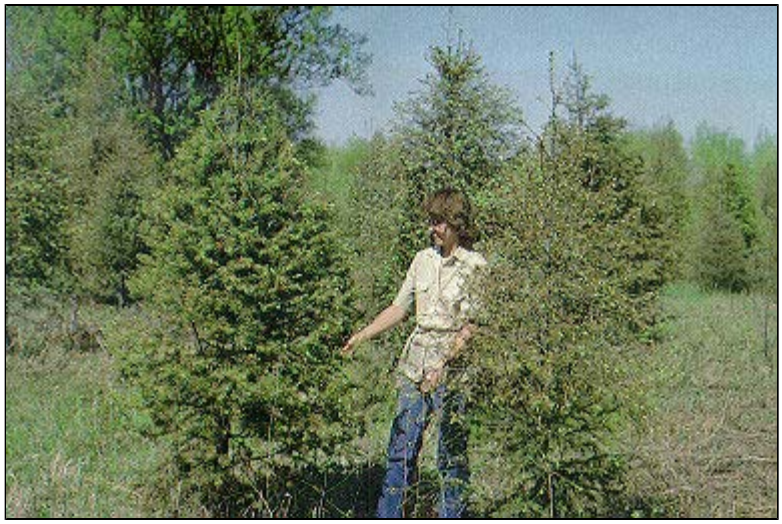
needles either on the upper or lower surface of the brown mottled spots. At first they appear as round cushions. In May-July (depending on location) the needle epidermis covering these cushions ruptures with an irregular slit exposing the pale orange spore bearing areas. Ascospores are released during wet weather and are wind disseminated to other trees. Spores can only infect elongating young needles at bud break. Fruiting bodies will develop and mature on these infected needles during the following winter and early spring.

The fruiting bodies of R. pseudotsugae *rupture the needle epidermis in spring exposing the spore bearing areas.*

Fruiting bodies of P. gaumanni *(Swiss needlecast) protruding from stomata appear as small black dots.*

Swiss Needlecast

Fruiting bodies appear only in rows of stomata on the underside of infected needles as early as August of the first year (more commonly Nov-March) in the Lake States. When magnified, these fruiting bodies appear as lines of black dots emerging from the normal white stomates. Fruiting bodies are very similar to those found on blue spruce trees infected with Rhizosphaera needlecast. These fruiting bodies also produce airborne ascospores that are released in wet weather. Major spore release and infection coincides with bud-break and new shoot growth, but some spores are released throughout the summer. Infection is mostly on new needles but some are infected during the second year. The disease spreads mostly within the infected tree and to adjacent trees, but spores can be disseminated over long distances. This pathogen is mainly disseminated through shipment of infected nursery stock.



The Douglas-fir on the right is infected with both Rhabdocline and Swiss needlecast. The tree on the left shows resistance to these two diseases.

CONTROL

Cultural

- Control vegetation around base of trees to increase air circulation and reduce moisture conditions necessary for infection.
- Plant healthy stock.
- Identify disease early to minimize losses.
- Shear trees in healthy plantations first to avoid contamination of these plantations by workers' clothing and equipment.
- Sterilize tools by dipping in denatured alcohol for 3 minutes after shearing infected plantations.

Genetic

- Most Douglas-fir plantations contain some trees with genetic resistance to Rhabdocline and/or Swiss needlecast. These trees should be favored whenever possible and should be used for seed collection programs.

Chemical

- *Rhabdocline*
  Trees should be sprayed with chlorothalonil (Daconil 2787 WP) at 21/2 pounds per 100 gallons of water in hydraulic spray equipment or 5 1/2 pounds per 100 gallons in high-pressure mist blower. Apply at 1112 to 23/4 lbs/acre for aerial spray. Foliage should be completely covered. The first application must be made as soon as some of the trees start to break bud. Treatment should be repeated 2-3 times at 2-3 week intervals.

  The timing for fungicide control of Swiss needlecast is fairly close to that required for Rhabdocline. However, control of Rhabdocline will require an early spray applied before Swiss needlecast control is needed.

- *Swiss Needlecast*
  Trees should be sprayed with chlorothalonil (Daconil 2787 WP) at 2 1/2 pounds WP per 100 gallons of water in hydraulic spray equipment or 51/2 pounds per 100 gallons in high-pressure mist blower. Use 1 1/2 to 2 3/4 lbs/acre for aerial application. Make first application in the spring as soon as new shoots are 1/2 to 2 inches long (this would be too late for control of Rhabdocline); make the second application 2-3 weeks later. If rainfall is high a third application may be necessary. Two years of fungicide protection will restore moderately infected trees to full foliage. Heavily infected stands will require longer.

  Nursery managers should follow a more intensive spray program to avoid the chance of shipping infected stock. In the Lake States the stock should be protected at 2-week intervals from bud break until mid-August. Swiss needlecast can be controlled using the above recommendations when spray application is based on foliage development.

References

For Rhabdocline

Collins, D.G. Rhabdocline needlecast of Douglas-fir in British Columbia. Forest Insect and Disease Survey Pest Leaflet 32. Canadian Forestry Service, 1971.

Morton, H.L.; Miller, R.E. Chemical control of Rhabdocline needlecast of Douglas-fir. Plant Dis. 66: 999-1000; 1982.

O'Brien, J.G. Studies on Rhabdocline spp. occurring in Michigan Christmas tree plantations. Masters thesis. Ann Arbor, MI: University of Michigan; 1981. 77 p.

For Swiss Needlecast

Ford, K.F. The etiology, distribution, and impact of Swiss needlecast on Douglas-fir in Michigan. Masters thesis. Ann Arbor, MI: University of Michigan; 1973. 32 p.

Morton, H.L.; Patton, R.F. Swiss needlecast of Douglas-fir in the Lake States. Plant Dis. Rep. 54: 612-616; 1970.

Skilling, D.D. Control of Swiss needlecast in Douglas-fir Christmas trees. Am. Christmas Tree J. 25: 34-37; 1981.

Darroll D. Skilling
Principal Plant Pathologist
North Central Forest Experiment Station
St. Paul, Minnesota

Harrison L. Morton
Professor
School of Natural Resources
University of Michigan
Ann Arbor, Michigan

Copies Available from-

North Central Forest Experiment Station
1992 Folwell Avenue
St. Paul, MN 55108

1983

UNITED STATES GOVERNMENT PRINTING OFFICE HT-59